Elementary Diagnosis

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ESSENTIALS

OF

Physical Diagnosis

FOR

MEDICAL STUDENTS.

BY

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PREFACE.

THE excuse for offering the present volume is not because of any deficiency in treatises on Physical Diagnosis, but because most of these works are too voluminous and contain more details and exceptions than the average student can grasp during the first part of his medical career. It is well to start with a foundation of *principal facts*, and after these are thoroughly mastered it becomes much easier to appreciate and understand the exceptions to the *general rule* which are met with in atypical cases.

After having quizzed upon this subject of Physical Diagnosis for several years, in connection with University teaching, this fact has become emphasized to me, and at the request of many students the book has been compiled.

Its object is to furnish to medical students of the First and Second year classes, just that material which is required of them by the respective examiners.

Both sets of lectures have been incorporated, and as they are identical, in the main, it only became necessary to indicate (by the asterisk) those points in which the two courses did not agree.

The subject-matter has been arranged in the form of questions and answers, thus giving all the necessary points and, at the same time, showing how the questions are usually asked at the final examinations. My sincere thanks are due to both Dr. John H. Musser and Dr. Judson Daland for so willingly reading over the proof. If the book prove of any value to beginners toward the clearer understanding of fundamental truths in the art of discriminating disease, it will have accomplished the purpose of

THE AUTHOR.

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CONTENTS.

ESSENTIALS OF PHYSICAL DIAGNOSIS.

What is Physical Diagnosis?

The discrimination of disease by the aid of the special senses.

What methods are employed in Physical Diagnosis?

Inspection, Mensuration, Palpation, Percussion and Auscultation.

Which is the most valuable of these in Chest diseases?

Auscultation.

Which in Abdominal Diagnosis?

Palpation and Percussion.

What can be learned by Inspection in Lung diseases?

Shape and expansion of the Chest; any prominence, depression, or inequality, and Decubitus.

How is Inspection divided?

Into General and Local inspection.

What do you mean by Decubitus?

Decubitus means position in bed, and is characteristic in certain diseases, such as Peritonitis, Pleurisy and Pneumonia.

What is Mensuration?

Measuring—(not often employed).

What instrument is used for Mensuration?

Either the Cyrtometer or an ordinary tape-measure.

Describe the Cyrtometer?

It consists of a saddle (fitting over the spine) and two arms of flexible metal graduated in inches.

Do both chests measure the same normally?

In right-handed people the right chest measures about half an inch more than the left; and vice versa.

What is Palpation?

The application of the hand.

What does palpation chiefly reveal in Chest diagnosis?

Alterations in fremitus, and degree of respiratory expansion.

How many kinds of Fremitus are there?

Four—(1) Vocal, (2) Tussile, (3) Rhoncal, (4) Friction.

What is Vocal Fremitus?

The vibration produced by the spoken voice, communicated through the lung and chest wall to the palpating hand.

What is Tussile fremitus?

That produced by the patient coughing.

What is Rhoncal fremitus?

That produced by a large rale in a bronchial tube, or in a cavity.

What is Friction fremitus?

A fremitus produced by the rubbing together of two inflamed serous membranes, such as that produced in Pleurisy and Pericarditis.

Where is Vocal fremitus felt over the Normal Chest?

Over the whole chest, except in the hepatic and cardiac regions anteriorly, and the two scapular regions posteriorly.

What Physiological conditions increase Vocal fremitus?

(1) A Resonant voice, (2) A thin chest wall.

What Pathological conditions increase Vocal fremitus?

Solids being a better conductor of sound than air, any condition which increases the solidity of the lung increases vocal fremitus. These are (1) Congestion of the lungs; (2) Croupous Pneumonia; (3) Cartarrhal Pneumonia; (4) Phthisis.

What Physiological conditions decrease Vocal fremitus?

(1) A Weak voice; (2) A thick chest wall.

What Pathological conditions decrease Vocal fremitus?

(1) Obstructed bronchus; (2) Thickened pleura; (3) Effusion of air or liquid into the pleural cavity; (4) Emphysema; (5) Pulmonary œdema; (6) Tumors of the lung.

How can you localize small areas, in palpation?

By using the Ulnar edge of the hand or a Florence flask.

How is Vocal fremitus best elicited?

By having the patient repeat slowly and distinctly the numbers, one, two, three, or ninety-nine.

What are the two methods of Percussion?

(1) Immediate or Direct, and (2) Mediate or Indirect.

What is the object of Percussion?

To determine Resonance, Pitch and Resistance.

What instruments are employed in Percussion?

Either the fingers, or a Plexor (the hammer) and a Pleximeter (which receives the stroke).

What are the disadvantages of Plexors and Pleximeters?

A new sound is added, and the amount of resistance cannot be recognized.

How is Percussion performed?

The index and middle finger of the right hand are used as the plexor, and should be pressed firmly together, slightly curved, nails cut short, and finger-tips on a level. The motion is from the wrist, stroke regular, not too rapid, and is delivered against the middle finger of the left hand (pleximeter) just behind the nail. This finger must be firmly pressed against the chest wall, to compress the underlying tissues, and to recognize any abnormal resistance offered.

When should the middle finger alone be used as the plexor in percussing?

In percussing superficial areas, and in children.

When may the flat of the hand be employed in direct percussion?

Occasionally to differentiate the two chests as a whole, as in catarrhal pneumonia or pleural effusion.

What bone is sometimes used as a pleximeter?

The clavicle (in percussing the apex of the lung).

What name is given to the normal percussion note obtained over the lungs?

Normal Pulmonary resonance.

What is the area of Normal percussion Resonance?

From ½ an inch above the clavicle to the spine of the tenth dorsal vertebra posteriorly, and in front, as low as the sixth rib; except in the præcordial region.

What conditions will increase percussion resonance?

(1) Thin chest walls, (2) In children, (3) Emphysema, (4) Pneumothorax, (5) Empty cavities, (6) Sometimes empty stomach (by its proximity to the lung).

What names are given to notes more resonant than Normal Pulmonary Resonance?

In their order, (1) Hyper-resonance, (2) Tympany, (3) Cracked-pot sound (a modified tympany).

***Where may thoracic Tympany be found normally?**

(1) Trachea, (2) Left infra-axillary region, from encroachment of stomach.

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* First year students are not held responsible for the questions preceded by the asterisk (*).

What chest diseases give Tympanitic percussion?

(1) Superficial Vomica, (2) Pneumothorax, (3) Rarely Pneumonia or Pleural Effusion (by throwing air into vibration, in trachea and bronchi.)

What conditions give Cracked-pot sound?

(1) Cavity communicating with a bronchus; (2) Pneumothorax with fistula of lung.

What names are given to percussion notes less resonant than normal?

In their order, (1) Impaired resonance, (2) Dulness (slight, moderate and marked), (3) Flatness.

What conditions decrease Percussion Resonance?

(1) Thick chest walls; (2) Consolidation of lungs (Phthisis-Pneumonia); (3) Liquid exudates into pleural cavity or plastic pleurisy; (4) Collapse of lung; (5) Œdema and Congestion of lungs.

What are the two methods of Auscultation?

(1) Immediate or direct (ear in direct contact); (2) Mediate or indirect (single or double stethescope used).

Which stethescope is ordinarily to be preferred?

The single stethescope.

What does Auscultation study in Pulmonary Diagnosis?

(1) Breath sounds; (2) Voice sounds (vocal Resonance); (3) Presence of Râles.

What is Vocal Resonance?

The transmission of the voice sounds through the lungs and chest walls, to the applied ear.

To what is Vocal Resonance closely allied?

Vocal resonance in Auscultation is the analogue of Vocal fremitus in Palpation.

What Physiological conditions increase Vocal Resonance?

(1) Resonant voice, (2) Thin chest walls. (It is normally increased over the right apex).

What Pathological conditions increase Vocal Resonance?

(1) Any consolidation of the lung; (2) Cavity.

What Physiological conditions decrease Vocal Resonance?

(1) A Weak voice; (2) Thick chest walls.

What Pathological conditions decrease Vocal Resonance?

(1) Obstructed Bronchus, (2) Pleural effusion, (3) Emphysema, (4) Pulmonary œdema.

What are the modifications of Increased Vocal Resonance?

(1) Bronchophony, (2) Pectoriloquy, (3) Aegophony.

What is Bronchophony?

An exaggerated Vocal resonance, seeming to come directly from the bronchial tube.

What is the significance of Bronchophony?

It is diagnostic of the second stage of Acute Croupous Pneumonia.

What is Exaggerated Vocal Resonance?

That heard over cavities and Consolidated lung.

What is Pectoriloquy?

The Transmission of *articulate* words, to the auscultating ear.

What is the significance of Pectoriloquy?

A cavity or Complete consolidation of the lung.

What is the significance of whispered Pectoriloquy?

Always means a cavity.

What is Aegophony?

A bleating or goat-like sound, produced by a thin layer of pleural effusion being set into vibration.

In which stages of a pleural effusion is Aegophony heard?

In the first and third stages.

Of what does Respiration consist?

Inspiration and Expiration (Inspiration is about twice (Daland) or three times (Musser) as long as Expiration).

What is the Normal Respiratory rate?

About 18. It may be as low as 14 in the aged, or as high as 24 in children, in health.

What are the three Types of breathing?

(1) Costal, in women; (2) Abdominal, in children; (3) Costo-Abdominal, in male adults.

What are the Components of the Respiratory Murmur?

(1) Bronchial breathing, and (2) Vesicular Murmur.

What changes does the Normal Vesicular Murmur undergo in disease?

I. *Alterations in Intensity.*

(*a*) Increased; as in Puerile or Vicarious breathing.

(*b*) Decreased; as in Emphysema or partial occlusion of the bronchus.

(*c*) Absent; as in total occlusion of the bronchus.

II. Alterations in Rhythm.

(*a*) Cog-wheel or jerky, (as in Incipient Phthisis).

(*b*) Cheyne-Stokes breathing.

What is Cheyne-Stokes Breathing?

A form of Dyspnœa consisting of a period of active breathing, lasting from 40 to 60 seconds, followed by a period of no breathing or Apnœa, lasting 10 to 35 seconds.

In what diseases may Cheyne-Stokes Respiration occur?

(1) Fatty Heart; (2) Valvular heart disease; (3) Tubercular Meningitis; (4) Brain tumor in the region of the floor of the fourth Ventricle; (5) Advanced Bright's Disease.

What is the significance of Cheyne-Stokes respiration occurring in the course of Heart Disease?

It is usually a precursor of death.

What are the six kinds of breathing met with in different forms of disease?

(1) Bronchial, (2) Vesicular, (3) Broncho-Vesicular, (4) Cavernous, (5) Broncho-Cavernous, (6) Amphoric

What is Bronchial breathing?

A high-pitched, tubular breathing; Expiration nearly as long as inspiration.

Where is Bronchial breathing heard normally?

Over the trachea in front and in the interscapular region posteriorly.

In what diseases do we hear bronchial breathing?

In Pneumonia and Phthisis.

What is Broncho-Vesicular breathing?

Harsher than normal, but not so harsh as bronchial breathing; heard in the first stage of Phthisis.

What is pure Vesicular breathing?

Softer than normal and heard in Emphysema.

What is Cavernous breathing?

Low-pitched, hollow, prolonged expiration, heard over a cavity.

What is Broncho-Cavernous breathing?

Bronchial in connection with Cavernous breathing, heard when a cavity communicates directly with a bronchial tube.

What is Amphoric breathing?

A low-pitched, hollow, metallic breathing, heard in Pneumothorax or in a lung cavity with tense walls.

What is Puerile breathing?

The breathing of childhood—Expiration nearly as

long as inspiration and both acts distinctly heard. It is also called Exaggerated or Vicarious breathing, and is heard over a normal lung doing extra work.

What is Emphysematous breathing?

Weak inspiration and a soft, low-pitched, prolonged expiration.

What is Asthmatic breathing?

Expiration prolonged, wheeezing, high-pitched (Differentiated from bronchial breathing, by being universal).

REGIONS OF THE CHEST.

How is the chest divided horizontally by nature?

By ribs and interspaces.

What is the rule for counting ribs?

Count the clavicle as the first rib.

Which is the most important third of the Clavicle, from a medical standpoint?

The middle third, because the apex or the lung lies behind it.

How many Sternal lines?

Three—Mid-sternal, and right and left sternal borders.

What is the Parasternal line?

A perpendicular line drawn half way between the sternal border and the nipple line, (on each side).

What is the nipple line?

A perpendicular line drawn from the centre of the clavicle parallel to the sternum.

What is the horizontal nipple line?

A line drawn horizontally around the chest, passing through both nipples.

How many Axillary lines?

Three on each side—(1) Anterior axillary line, dropped

perpendicularly from the junction of the anterior fold of the axilla with the chest ; (2) Posterior Axillary line, dropped from the posterior fold ; (3) Mid-axillary line, half way between these two.

Into what regions is the lateral aspect of the chest divided ?

Two—(1) Axillary and (2) Infra-axillary,

What are the regions immediately above and below the clavicle called ?

Respectively, the Supra- and Infra-clavicular fossæ.

What is the depression at the root of the neck called ?

The supra-sternal Notch.

What is the lower third of the sternal region called ?

The Ensiform region.

What is the region about the breast called ?

The Mammary region, (which includes the nipple region).

What is the Præcordial region ?

The region in front of that part of the heart not covered by lung.

How are the regions above and below the spine of the scapula named ?

Respectively, the Supra- and Infra-Spinous fossæ.

What is the region below the shoulder-blade called ?

The Sub-scapular region.

What area lies between the two scapulæ?

The Inter-Scapular region.

Name the New or Adventitious Sounds?

(1) Râles or Rhonci.
(2) Friction sounds.
(3) Metallic tinkling.
(4) Hippocratic Succussion splash.

How are Rales divided?

Into Dry and Moist rales.

(For Dr. Musser's classification, see page 75.)

How many kinds of Dry rales?

Two—Sibilant and Sonorous, according to the calibre of the tube in which they are produced. Sibilant rales are high-pitched dry rales, produced in small bronchial tubes; sonorous rales are low-pitched dry rales occurring in the larger tubes. May be heard in inspiration, expiration, or both.

What is the significance of Dry Rales?

They occur in Bronchitis and Asthma.

How are Moist Rales divided?

(1) Crepitant, (2) Sub-crepitant, (3) Crackling, (4) Mucous, (5) Bubbling or Gurgling.

What are Crepitant Rales?

A number of fine sounds occurring *simultaneously* at the end of inspiration—Pathognomonic of the first stage of Croupous Pneumonia.

What are Crackling Rales?

A number of fine sounds occurring in *succession* at the end of inspiration—Pathognomonic of the first stage of Phthisis.

What are Sub-crepitant Rales?

Small moist sounds occurring in the bronchioles and heard in both inspiration and expiration.

What is meant by Mucous rale?

A generic term for a moist rale produced by either mucus, blood, serum or pus. Mucous rales are large, medium or small, according to size.

What are Bubbling rales?

The largest kind of moist rale, and may be produced in (1) the trachea, (2) a dilated bronchus, or (3) in a pulmonary or pleural cavity.

What are Friction sounds?

To and fro-friction sounds; heard in both inspiration and expiration, in first and third stages of Acute pleurisy, and in Pericarditis, in which case they are synchronous with the heart-beat.

***How can the Friction sounds of Pleurisy be distinguished from Sub-Crepitant rales?**

Sub-Crepitant rales are not so superficial and are influenced by coughing.

What is meant by Metallic Tinkling?

A tinkling sound in the pleural cavity, produced by the dropping of a fluid into a Hydro-pneumothorax.

What is the Hippocratic succussion splash?

A splashing sound heard in Hydro-Pneumothorax when the chest is shaken.

What are the characteristics of the Normal Chest?

(1) No depression above or below the clavicle.
(2) Both sides expand equally.
(3) Antero-postero diameter less than the transverse.
(4) Inferior Costal angle should be a right angle.
(5) Scapulæ should lie flat to the chest.

What is a Phthisical Chest?

Long, flat chest; ribs oblique, inferior costal angle acute, depression below clavicle, projecting scapulæ forming the so-called winged or Alar Chest?

* **What is a Rachitic Chest?**

A pigeon chest—sternum prominent and sides flattened—bony prominences where ribs join their cartilages; called beaded ribs.

What is the Emphysematous Chest?

A barrel-shaped chest. Antero-posterior diameter much increased; interspaces wide; Inferior Costal angle obtuse; little expansion of chest in breathing.

* **What may cause a bulging of one side of the chest?**

(1) Vicarious emphysema.
(2) Pleural effusion of liquid or air.
(3) Tumors of the lung (rare).
(4) Enlarged heart, liver or spleen.

* **What may cause Unilateral or Local Depression?**

(1) Phthisis.
(2) Chronic pleurisy.

PULMONARY DISEASES.

What is Acute Bronchitis?

An acute inflammation of the mucous membrane of the larger bronchial tubes.

What are the Physical signs of the first stage of Acute Bronchitis?

Signs negative except sonorous and sibilant rales on Auscultation; little or no expectoration.

What are the signs of the second stage?

Signs negative except that mucous rales replace the dry rales of the first stage, and the patient expectorates more or less copiously.

* **What is Capillary Bronchitis?**

An inflammation of the smaller bronchial tubes—met with chiefly in children and old persons.

* **What are the signs of Capillary Bronchitis?**

Inspection. Alæ of nose play; sterno-mastoid muscles prominent; Supra-sternal notch deep; base of chest sucked in.

Palpation and *Percussion* negative.

Auscultation. Sibilant rales first, followed by sub-crepitant rales over bases of lungs.

* **What is apt to be the sequel of long-continued Bronchitis?**
Emphysema or Bronchiectasis (dilatation of tubes).

How many forms of Pneumonia are there?
(1) Croupous or Lobar, and (2) Catarrhal, Lobular or Broncho-Pneumonia.

What is acute Croupous Pneumonia?
An acute inflammation of the lungs.

What is the exciting cause of Croupous Pneumonia?
The Pneumonococcus and extravasation of blood.

How many stages has Croupous Pneumonia?
Three; (1) Congestion, (2) Consolidation or Red Hepatization, and (3) Resolution or Grey Hepatization.

What is the Morbid Anatomy of these Three stages?
First stage. Lung is congested, less crepitant and a little heavier than normal; no exudate.
Second stage. Red, heavy and solid; vesicles filled with exudation of plasma.
Third stage. Lung is less solid and yellowish from fatty degeneration of the exudate.

What are the physical signs of the First stage?
Inspection. Dyspnœa, flushed cheek, rusty sputum, accelerated respiration and heart-beat.
Palpation. Increased fremitus and decreased expansion.

Percussion. Impaired resonance.
Auscultation. Crepitant rales.

What are the signs of the Second stage ?

Inspection. Same as first stage except respiration is more rapid, and no expansion.
Palpation. Increased fremitus and absent expansion.
Percussion. Fixed dulness marked and sense of resistance to finger noted.
Auscultation. Bronchial breathing and Bronchophony, no rales.

What are the signs of the Third stage ?

Same signs, except on auscultation breath sounds a little softer and moist rales are present in considerable number, due to liquefaction of the exudate. (First sub-crepitant then mucous rales.)

What is Catarrhal or Broncho-Pneumonia ?

An inflammation of the terminal bronchioles and alveoli.

What is the cause of Catarrhal Pneumonia ?

From extension of a bronchitis into the air vesicles; or by the desquamation of epithelium.

What is the morbid anatomy of Catarrhal Pneumonia ?

A bilateral disease, giving scattered areas of consolidation through both lungs.

What are the signs of Catarrhal Pneumonia ?

Like those of Croupous Pneumonia, but less marked,

and sub-crepitant rales replace the crepitant of croupous, and the areas of consolidation are scattered and less defined.

What is the frequency of Tuberculosis as a cause of death?

One out of seven deaths is due to this process, which may affect almost any tissue in the body.

What is the exciting cause of Tuberculosis of the lungs?

The tubercle bacillus, which enters the body through respiration, digestion or direct inoculation.

How many stages has Phthisis?

Three; (1) Infiltration, (2) Consolidation, (3) Softening and Cavity formation.

What is the Morbid Anatomy of these three stages?

First stage. Scattered grey tubercles at apex, size of a millet seed.

Second stage. Cheesy infiltration forming a soft mass from tubercles running together and undergoing a fatty degeneration.

Third stage. Softening and the formation of cavities.

***What are the types of Phthisis?**

(1) Catarrhal and (2) Fibroid.

***What are the characteristics of Catarrhal Phthisis?**

It is a catarrhal pneumonia in conjunction with the tubercle bacillus.

***What is Fibroid Phthisis?**

Phthisis in which there is great overgrowth of connective tissue.

***What is Phthisis Florida?**

Galloping Consumption, in which from the beginning large areas of the lungs are involved in catarrhal phthisis and the disease runs a rapid fatal course.

What are the signs of the First stage of Phthisis?

Inspection. Negative; or perhaps a phthisinoid chest.

Palpation. Slightly increased fremitus.

Percussion. Impaired resonance, high pitched.

Auscultation. Slightly increased vocal resonance; Broncho-vesicular breathing; Crackling rales.

What are the signs of the Second stage?

Inspection. Diminished expansion, Dyspnœa, and prominent cavicle.

Palpation. Increased fremitus, decreased expansion.

Percussion. Dulness.

Auscultation. Bronchial breathing and increased vocal resonance. Mucous râles.

What are the signs of the Third stage?

Inspection. Dyspnœa; Emaciation; Absent expansion and Phthisical chest.

Palpation. Vocal fremitus, usually decreased; Absent expansion.

Percussion. Local tympany and sometimes cracked-pot sound.

Auscultation. Cavernous breathing, Pectoriloquy and bubbling rales usually.

When may no rales be heard over a cavity?

(1) If cavity is empty.

(2) If completely filled.

(3) If no air enters, from obstruction of bronchus.

What is the expectoration of Phthisis?

Heavy greenish-yellow *nummular* (coin-shaped) sputum containing tubercle bacilli, fibro-elastic tissue and cheesy particles. Sinks in water.

What is Acute Miliary Tuberculosis?

An acute general tubercular disease of the lungs (and other tissues) usually fatal in two to four weeks.

What are the Physical signs of this disease?

Very unsatisfactory. *Inspection:* Fever, Dyspnœa, Cough and expectoration.—*Palpation* and *Percussion* negative. *Auscultation;* negative, or perhaps a few bronchitic rales, usually sibilant or sub-crepitant.

What is Pulmonary Emphysema?

A permanent over-distension of the air-cells of the lungs.

***How is Emphysema of the lungs divided?**

(1) Interlobular; (very rare) air in the interstitial tissue of the lungs from rupture of air vesicles.

(2) Vesicular, which is increased air in the lungs with dilatation of the vesicles.

What are the varieties of the Vesicular form?

1. Compensatory or Vicarious—when one lung or a part of it is doing extra work.

2. Atrophic—occurring in old people, from atrophy of the solid tissue of the lungs.
3. Hypertrophic (most important)—a bilateral disease due to overstretching of the vesicles.

What is the cause of Emphysema?

Strained expiration (as in (1) Chronic bronchitis; (2) Asthma; (3) Certain occupations; as glass-blowers, cornet-players, etc.).

What is the anatomy of Emphysematous lungs?

Lungs are large, pale and often show large bullæ on their free margins. Feel like cotton, being soft and spongy, and show marks of the ribs.

What are the physical signs of Emphysema?

Inspection. Emphysematous or barrel-shaped chest.

Palpation. Diminished fremitus.

Percussion. Universal hyper-resonance, with decreased or absent cardiac, splenic and hepatic dulness.

Auscultation. Diminished vocal resonance, weak inspiration, and prolonged low-pitched or inaudible expiration.

What is Asthma?

Paroxysmal dyspnœa, due to spasm of the bronchial tubes.

What are the varieties of Asthma?

(1) Essential or Idiopathic; (2) Bronchitic, due to inflammation of bronchial tubes; (3) Cardiac; (4) Renal; (5) Reflex (hay or catarrhal asthma).

What are the signs of Asthma?

Inspection. Intense dyspnœa and little expansion. *Palpation* and *Percussion* negative.

Auscultation. Sonorous and sibilant rales, short inspiration and prolonged, high-pitched, wheezing expiration heard over the whole chest.

PLEURAL AFFECTIONS.

How many stages has acute Pleurisy?

Three. (1) Dry stage—membranes red, sticky and lustreless.

(2) Stage of Effusion—which may be (*a*) serous (hydrothorax); (*b*) Purulent (empyema or Pyothorax); (*c*) Fibrinous (plastic pleurisy).

(3) Stage of Absorption (when effusion is serous).

What are the signs of the first stage of Acute Pleurisy?

Inspection. Restricted expansion (from pain) and dyspnœa; patient favors affected side.

Palpation. Diminished expansion and occasionally a friction fremitus is felt.

Percussion. Negative except sound lung is hyper-resonant from vicarious work.

Auscultation. Weak breathing with a to-and-fro friction rale, superficial and synchronous with respiration.

What are the signs of the second stage with serous effusion?

Inspection. No pain; bulging of interspaces; diminished expansion; dyspnœa; displaced apex-beat. Lies on affected side.

Palpation. Diminished fremitus; displaced apex-beat.

Percussion. Movable dulness (hydrostatic test). Above level of liquid hyper-resonance (Skoda's resonance).

Auscultation. Weak or absent breath sounds below liquid and bronchial breathing posteriorly over bronchus. Vocal resonance absent, or if effusion be small, ægophony, best heard at angle of scapula.

What are the signs of the stage of Absorption?

Breath sounds, vocal fremitus and resonance, ægophous and friction sounds return; and area of movable dulness gradually disappears.

***How can Pyothorax or purulent effusion be recognized?**

(1) Occasionally there is pitting on pressure; (2) By Aspiration; (3) Symptoms of Hectic fever.

***What are the signs of Plastic Pleurisy?**

Inspection. No bulging of interspaces or displacement of apex-beat, but later a retraction of the chest.

Palpation. Diminished fremitus.

Percussion. *Fixed* dulness.

Auscultation. Weak breathing; diminished vocal resonance, friction rale may still be heard; pain continues, and needle gives a negative result.

What is Pneumothorax?

Air in the pleural sac.

What are the causes of Pneumothorax?

(1) Rupture of lung into pleura (from abscess, phthisical cavity or emphysema).

(2) Traumatism of any kind (as stab or gunshot wounds).

(3) Rupture of an empyema.

What are the physical signs of Pneumothorax?

Inspection. Intense dyspnœa (40 to 50 per minute); bulging of interspaces; immobility of chest; displaced apex-beat.

Palpation. Expansion and vocal fremitus absent.

Percussion. Unilateral tympany; and percussing with silver coins yields "Bell tympany" (on auscultation).

Auscultation. Breath sounds and vocal resonance weak or absent; amphoric breathing (if fistula is patulous). Amphoric pectoriloquy.

From what must Pneumothorax be differentiated?

(1) *Emphysema*, which is *bilateral*, and the percussion note is only hyper-resonant and not tympanitic.

(2) *Dilated stomach*, in which case the tympany does not extend so high, and when the patient is allowed to swallow water it can be distinctly heard trickling into the stomach.

What is usually the sequel of Pneumothorax?

Hydro-pneumothorax or Pyo-pneumothorax.

What is meant by Hydro-pneumothorax and Pyo-pneumothorax?

Hydro-pneumothorax is both serum and air in the pleural cavity.

Pyo-pneumothorax is pus and air in the pleural cavity.

What are the signs of Hydro-pneumothorax ?

Inspection. Bulging; immobility of chest and displaced heart.

Palpation. Diminished or absent fremitus; immobility; displaced heart, and spleen or liver.

Percussion. Freely movable dulness (hydrostatic test) above liquid, tympany and Bell tympany (coin test).

Auscultation. Absent breath sounds; amphoric pectoriloquy (if fistula present) and amphoric breathing; hippocratic succussion splash (pathognomonic) metallic tinkle, and "Bell tympany" with silver coin percussion. Bubbling rales.

What are the signs of Pyo-Pneumothorax?

Same as in hydro-pneumothorax with also signs of hectic fever and pitting on pressure. Aspiration confirms the diagnosis.

CARDIAC DIAGNOSIS.

Describe the circulation of the blood?

The venous blood is returned from the body by the two Venæ cavæ to the Right Auricle, where it passes through the Tricuspid orifice into the Right Ventricle. The contraction or systole of the Right Ventricle forces the blood past the Pulmonary Semi-lunar valves, and through the Pulmonary Arteries to the lungs, where it is aerated and then returned to the Left Auricle by means of the Pulmonary veins. It then passes through the Mitral orifice to the Left Ventricle, the contraction of which sends it past the Aortic Semi-lunar valves into the Aorta and thence throughout the general system.

What is the Heart?

A hollow muscular organ, acting as a duplex pump, and containing four cavities.

What is the size of the normal Heart?

Roughly, it is stated to be the size of the individual's clenched fist.

What is the average weight of a normal Heart?

Eight to ten ounces.

What is the normal position of the Apex-beat?

In the fifth interspace one inch within the nipple line. (In children it may be as high as the fourth interspace; and in the aged as low as the sixth.)

What factors are to be noted in regard to the Apex-beat?

(1) Position. (2) Extent. (3) Force or intensity.

How may the Apex-beat be brought out?

(1) Exercise. (2) Inclining the body forward and to the left. (3) Deep expiration.

* **What may displace the Apex-beat toward the right?**

(1) Hypertrophy and dilatation of Right Ventricle. (2) Left-sided pleural effusion. (3) Contracting right lung disease.

* **What may displace the Apex-beat toward the left?**

(1) Hypertrophy, or (2) Dilatation of Left Ventricle. (3) Pericardial effusion. (4) Right-sided pleural effusion. (5) Abdominal tumors or dropsies. (6) Contracting left lung disease.

* **What may displace the Apex-beat downwards?**

(1) Cardiac Hypertrophy and Dilatation; and (2) Emphysema of lungs.

* **What increases the force of the heart-beat?**

(1) Thin chest walls; (2) Excitement; (3) Emotions; (4) Stimulants; (5) Exophthalmic goitre; (6) Hypertrophy.

* **What diminishes the force of the Apex-beat?**

(1) Thick chest walls; (2) Emphysema; (3) Pericardial effusion; (4) Dilatation; (5) Fatty degeneration.

* **What increases the extent of the Apex-beat?**

(1) Excitement; (2) Thin chest walls; (3) Phthisis; (4) Hypertrophy.

* **What may produce a thrill over the Apex?**

(1) Pericardial adhesion; (2) Aneurism (most common); (3) Mitral disease.

What are the areas of Cardiac dulness?

(1) Superficial (representing the uncovered part of the heart), and (2) Deep (whole area).

What is the triangle of Superficial dulness?

Hypothenuse of triangle from fourth left costo-sternal junction to apex-beat. Perpendicular of triangle formed by left border of the sternum. Base line, from apex of heart (fifth interspace within nipple line) horizontally toward right to left sternal border.

What is the normal area of deep Cardiac dulness?

From third left costo-sternal articulation to apex-beat; thence to right sternal border, and up right sternal border to third rib.

Where is the Mitral Area?

A circle one inch in diameter, corresponding to the apex region.

Where is the Tricuspid Area?

A circle one inch in diameter at the ensiform cartilage.

Where is the Pulmonic Area?

At the second left costal cartilage.

Where is the Aortic Area?

At the second right costal cartilage.

* **What causes increase the area of Cardiac dulness?**

(1) Thin subjects; (2) Fibroid Phthisis; (3) Hypertrophy; (4) Dilatation, (5) Pericardial effusion (triangle of dulness reversed).

* **What causes decrease the area of Cardiac dulness?**

(1) Thick chest walls; (2) Emphysema; (3) Pneumothorax.

What are the two sounds of the heart?

Systolic or First sound (heard best at apex), and Diastolic or Second sound, heard best at Aortic Cartilage). (These sounds are imitated by the words Lub–dup.)

What are the causes of the First sound?

(1) Contraction of the heart muscle.
(2) Striking of the heart against the chest wall.
(3) Closure of the Auriculo-Ventricular valves.
(These factors can only be distinguished in disease.)

What is the cause of the second sound?

Closure of the semi-lunar valves (Aortic and Pulmonary.) (Diastolic in time, and can be distinguished

from each other in health, the Aortic being louder than the Pulmonary.)

* **What causes increase the heart sounds?**

(1) Excitement; (2) Thin chest walls; (3) Hypertrophy; (4) Retraction of the lungs.

* **What causes decrease the heart sounds?**

(1) Thick chest walls; (2) Emphysema; (3) Pericardial effusion; (4) Constitutional weakness (after disease); (5) Fatty degeneration of heart muscle.

What is Endocarditis?

Inflammation of the lining membrane of the heart; affects chiefly the valves. (Called valvulitis.)

What are the causes of Endocarditis?

(1) Rheumatism (most frequent); (2) specific fevers; (3) Syphilis; (4) Alcoholism; (5) Bright's disease; (6) Pyæmia; (7) Excessive straining (may produce Aortic regurgitation).

What are the varieties of Endocarditis?

(1) Vegetative; (2) Interstitial (most common); (3) Ulcerative or malignant (rare) (due to pyæmic micrococci).

What lesions does Endocarditis produce?

Either Valvular obstruction or Regurgitation, or both.

Which valve is most commonly affected?

The Mitral Valve.

To what new sounds do these lesions give rise?
Organic heart murmurs.

From what must Organic murmurs be distinguished?
From Functional or Hæmic murmurs.

What are the chief points in this differential diagnosis?
(See table, page 74.)

What three factors determine the diagnosis of any particular valvular murmur?
(1) Time of murmur.
(2) Point of maximum intensity.
(3) Direction in which the murmur is transmitted.

How do you make the diagnosis of Mitral Obstruction?
(1) Presystolic in time; (2) Point of maximum intensity, one inch above apex; (3) Not transmitted.

What are the diagnostic signs of Mitral Regurgitation?
(1) Systolic murmur; (2) Heard loudest at apex; and (3) transmitted into left Axilla (and if loud enough, to angle of left scapula also).

How can you diagnose Aortic Obstruction?
(1) Systolic murmur; (2) loudest at Aortic Cartilage (second right costal cartilage); (3) transmitted into the Carotid Artery.

How is the diagnosis of Aortic Regurgitation made?
(1) Diastolic murmur; (2) loudest at Aortic Cartilage; (3) transmitted down the sternum.

What is the special sign of Aortic Regurgitation ?

The Corrigan or water-hammer pulse ; which is a quick, full and receding pulse.

What are the signs of Tricuspid Regurgitation ?

(1) Systolic murmur; (2) best heard over mid-sternum; (3) transmitted toward epigastrium.

What is the special sign of Tricuspid Regurgitation ?

Pulsation of Jugular Vein, and in bad cases pulsation also in the liver.

What are the signs of Tricuspid Stenosis or Obstruction ?

(1) Presystolic murmur; (2) best heard at mid-sternum; (3) not transmitted.

What are the signs of Pulmonary Obstruction ?

(1) Systolic murmur; (2) loudest at Pulmonic cartilage (second left costal cartilage) ; (3) transmitted into Pulmonary artery.

What are the signs of Pulmonary Regurgitation ?

(1) Diastolic murmur; (2) loudest at Pulmonic cartilage ; (3) transmitted down the sternum.

What is the frequency of Pulmonary and Tricuspid murmurs ?

All very rare. Pulmonary murmurs are congenital, and Tricuspid murmurs either congenital (if primary) or secondary to mitral murmurs.

What is meant by Compensation being established ?

Increased strength of heart to overcome obstruction

and make up for extra work, due to enlargement of heart cavity.

What are the chief affections of the Heart-muscle or Myocardium?

(1) Hypertrophy; (2) Dilatation; (3) Fatty degeneration.

What is Hypertrophy of the Heart?

An Enlargement of the heart-muscle.

What three forms of Hypertrophy are recognized?

(1) Simple, walls thicker, without change in size of cavity.

(2) Concentric, walls thicker, and cavity smaller than normal. (Only a post-mortem condition).

(3) Eccentric, walls thicker and cavity larger than normal.

What part of the heart is most frequently hypertrophied?

The left ventricle.

What are the causes of Hypertrophy of the Left Ventricle?

Any obstruction to the systemic circulation of the blood (such as arterial atheroma and Bright's disease).

What are the signs of Hypertrophy of the left heart?

Inspection. Forcible apex-beat displaced both downward and to the left.

Palpation. Confirms inspection.

Percussion. Area of cardiac dulness increased downward and to left.

Auscultation. Over apex, first sound stronger than normal and second sound accentuated (due to increased tension).

What is Dilatation of the heart?

An enlargement of the heart due to a stretching of the heart-muscle, causing an increase in the size of the cavity.

What are the causes of cardiac dilatation?

(1) Sudden increase in endocardial pressure.
(2) Degeneration of the heart muscle.

What are the signs of Dilatation of the heart?

Inspection and Palpation. Apex-beat diffuse and weak, or in extreme cases invisible.

Percussion. Gives increased area of dulness to left.

Auscultation. First sound weak, or in extreme cases valvular, like the second sound; often a murmur from mechanical stretching of orifice, rendering valve incompetent.

What are the two forms of Fatty Heart?

(1) Fatty Infiltration (occurring chiefly in obesity).
(2) Fatty Degeneration.

What are the signs of Fatty Infiltration of the Heart?

Dyspnœa; Weak pulse and heart sounds; Feeble impulse of heart associated with obesity.

What are the signs of Fatty Degeneration of the Heart?

Inspection. Apex-beat feeble and irregular or absent.

Palpation. Confirms.

Percussion. Area of Cardiac dulness normal.

Auscultation. First sound of heart weak or even valvular.

* **What are the symptoms of Fatty Degeneration of Heart?**

Same as in Valvular disease with lost compensation.

What is Angina Pectoris?

An agonizing paroxysmal cardiac pain, radiating to the left shoulder and down the left arm, and accompanied by a sense of impending death.

What is Angina Pectoris also called?

Breast Anguish.

Angina Pectoris is usually associated with what disease?

Either Valvular disease, or Fatty degeneration.

What is Pericarditis?

An inflammation of the serous membrane covering the heart (called the Pericardium).

What are the three kinds of Pericarditis?

(1) Serous (usual form); (2) Plastic; (3) Purulent.

What are the causes of Pericarditis?

Same as in Pleurisy. (Rheumatism most frequently.)

What are the stages of Acute Pericarditis?

First stage, Inflammation; *Second stage* of Effusion; *Third stage* of Absorption.

What are the signs of the first stage?

Inspection. Accelerated apex-beat in normal position.

Palpation. In some cases, a to-and-fro friction fremitus, and tenderness on pressure.

Percussion. Negative. Area of dulness not increased.

Auscultation. A superficial to-and-fro friction sound synchronous with the heart-beat, heard best over base, and not transmitted.

What are the signs of the Second Stage?

Inspection. Absent apex-beat; Bulging præcordia and intercostal spaces; Dyspnœa.

Palpation. Confirms inspection.

Percussion. Increased area of dulness, triangular in shape, with base down (movable dulness usually present).

Auscultation. Heart sounds feeble, distant and muffled; no friction sound.

What are the signs of the stage of Absorption?

Apex-beat reappears, area of dulness decreases and friction sound returns.

What are the signs in the second stage, if the effusion be Purulent?

Same signs as in serous effusion, but also Hectic fever is present and the aspirating needle shows pus.

What are the signs of the second stage, if the effusion be Plastic?

Apex not much displaced; pulsation is wavy over whole heart; præcordia shows dimpling, and friction sounds persist.

What is Paracentesis Pericardii?

Tapping the pericardial effusion; (fifth interspace usually selected).

What is an Aneurism?

The local dilatation of one or more coats of an artery.

What is the most common site of an Aneurism?

The Arch of the Aorta.

What are the ordinary forms of Aneurism?

(1) Fusiform; (2) Cylindrical; (3) Sacculated (4) Dissecting.

How does an Aneurism heal?

By laminated clots.

What are the causes of Aneurism?

(1) Injury or strain; and (2) Atheroma.

***What are the causes of Atheroma of an artery?**

(1) Syphilis; (2) Rheumatism; (3) Gout; (4) Alcohol; (5) Bright's disease; (6) Old age.

What are the physical signs of an Aneurism?

Inspection. Local bulging with pulsation.

Palpation. Expansile pulsation and thrill.

Percussion. Localized dulness.

Auscultation. Systolic Bruit or murmur, and secondarily, accentuated heart sounds.

What are the pressure symptoms of Aneurism of the Aortic Arch?

(1) Dyspnœa; (2) Dysphagia; (3) Weak or Absent breathing on affected side; (4) Aphonia or Laryngeal cough; (5) Unequal Pupils; (6) Unequal radial pulses; (7) Œdema of one side of neck with cyanosis; (8) Boring intercostal pain worse at night; (9) Progressive loss of flesh and strength (if thoracic duct is pressed upon); (10) Unilateral sweating of the face (from pressure on Cervical sympathetic).

***What is Grave's or Basedow's Disease?**

Exophthalmic Goitre.

***What is the cause of Exophthalmic Goitre?**

A functional or organic disease of the Cervical sympathetic ganglia.

***What are the symptoms of Exophthalmic Goitre?**

(1) Bulging eye-balls (from congested sockets); with paresis of the upper lids.

(2) Enlarged pulsating thyroid gland, gives a thrill on palpation and a Bruit on Auscultation.

(3) Palpitation of the heart leading to hypertrophy.

THE PULSE.

What is the Pulse?

The recognition of the variation in the size of an artery.

How is the pulse palpated?

By using the index, middle and ring fingers.

Why should the thumb not be used?

Because it is too broad and has a pulse of its own.

How is the pulse counted?

In ordinary cases, count for fifteen seconds and multiply by four to get the rate per minute. For accuracy count a full minute.

What is the normal Pulse-rate in an adult male?

Average is 72, but it may vary from 11 to 110 consistent with health. The average variation is 12 to 15 beats in health.

How can a very rapid pulse be counted?

By marking dots on paper with a lead pencil and afterward counting the dots.

Can the radial wall be felt in health?

No.

What are the most frequent causes of thickened arterial walls?

(1) Age, (2) Alcohol and (3) Syphilis.

What factors are to be noted in studying the Pulse?

(1) Condition of the Arterial wall.
(2) Size or volume of Pulse (whether large or small).
(3) Rate (rapid or slow).
(4) Rhythm (whether regular, irregular, intermittent or lagging).
(5) Force (increased or decreased).
(6) Tension (high or low) means intra-vascular pressure.
(7) Quality or length of the wave (short or long).

What effect has fever on the Pulse-rate?

Accelerates it about ten beats for each degree of fever, except in scarlet fever, when the acceleration is much greater in proportion to the temperature.

What is Tobacco heart?

A functional disturbance of the heart, usually associated with palpitation. Rate from 90–110.

What conditions may cause a slow pulse?

Icterus, Uræmia, Fright, Drugs, Age, Fatty degeneration of the heart (here it is also irregular and intermittent).

What may cause an irregular heart-beat?

Emotions, Alcohol, tea, coffee, tobacco, Fatty degeneration.

Upon what does the Force of the pulse depend?

Upon the strength of the heart and the size of the capillaries.

What instrument is used for taking pulse tracings?

The sphygmograph—a small instrument strapped upon the wrist. The beat of the pulse pressing upward upon a short lever, communicates its motion to a longer arm, the distal end of which traces the pulse wave upon a strip of blackened paper.

What is the pulse tracing called?

The sphygmogram.

What are the parts to a normal pulse tracing?

(1) Primary wave; (2) Secondary wave; (3) Aortic notch; (4) Dicrotic wave.

ABDOMINAL DIAGNOSIS.

Which are the most important methods in Abdominal Diagnosis?

Palpation and Percussion.

How is the Abdomen divided for convenience in study?

Into nine regions; formed by drawing two horizontal lines (one on a line with the crests of the iliac bones, the other parallel with the cartilages of the ninth ribs) and two perpendicular lines (one on each side from the cartilage of the eighth rib to the centre of Poupart's ligament).

What are the names of these nine regions?

Upper zone. Epigastric (in the middle) and right and left hypochondriac.

Middle zone. Umbilical (middle) and right and left lumbar.

Lower zone. Hypogastric (middle) and right and left iliac or inguinal.

What is the position of the normal spleen?

In the left hypochondriac region, between the ninth and eleventh ribs (in the mid-axillary line).

How should the spleen be palpated?

Use the flat of the hand and direct the patient to deeply expire, followed by an inspiration, which pushes the spleen against the hand and if enlarged, its edge may be felt.

Where is the Liver situated?

In the right hypochondriac region, extending from the fifth rib above (in the nipple line) to the margin of the ribs below.

How can the size of the stomach be obtained?

Have the patient swallow some water and then by percussion ascertain the outer limits of movable dulness, in connection with the gastric tympany.

What is washing out the stomach called?

Lavage.

How is this accomplished?

By means of the stomach pump or the syphon bottle.

What is forced feeding through a stomach tube called?

Gavage.

In what disease of the stomach is Hydrochloric Acid absent?

In Gastric Cancer.

In what disease of the stomach is this Acid increased?

In Gastric Ulcer.

How can you test for Hydrochloric acid in the gastric juice?

Congo red paper is turned blue (only by hydrochloric acid).

What is another test for gastric Hydrochloric Acid?

One drop of a six per cent. solution in alcohol of Phloro-Glucin-Vanillin (equal parts) added to one drop of the gastric juice will show a rose-red color on a porcelain dish, gently heated.

How do you test the gastric juice for Pepsin?

Place a small bit of coagulated egg albumen in a test-tube with some of the gastric juice containing HCl and place in a warm oven (100°F.). If pepsin is present in normal quantity the albumen will be digested in a few hours.

How can you test the rapidity of Absorption in the stomach?

Give Iodide of Potash in capsule and note how long before it appears in the saliva (by testing saliva with starch paper and sulphuric acid (one drop), which gives a blue color).

How can you tell when the food passes from the stomach into the intestines?

Give Salol in capsule, which is only broken up by the intestinal juices, liberating Salicylic acid, which is tested for in the urine by a ferric salt (Fe_2 Cl_6) giving a blue color.

What may cause abdominal Distension?

(1) Ascites; (2) Tympanites; (3) Pregnancy; (4) Enlargement of any organ; (5) Distended bladder.

What is Meteorism?

A moderate gaseous distension of the abdomen, recognized by percussion.

What is Tympanitis?

Marked gaseous distension of the abdomen, recognized by percussion.

What is a Scaphoid Abdomen?

One that is concave.

In what conditions is a Scaphoid Abdomen found?

(1) In wasting diseases, as cancer, etc.

(2) In Tubercular Meningitis.

What is Ascites?

Dropsy of the peritoneal cavity.

What are the most common causes of Ascites?

Chronic disease of the (1) Kidneys, (2) Heart, or (3) Liver (especially).

What are the Physical signs of Ascites?

Inspection. Uniform distension with tendency to sagging of the flanks.

Palpation. A sense of resistance and fluctuation.

Percussion. Umbilical region resonant and movable, dulness in flanks.

Auscultation. Negative.

How can you differentiate between Suppression and Retention of Urine?

By percussion, which gives dulness if retention ; reso-

nance if suppression—corroborated by passing a catheter.

What is the position of the Kidneys?

In the lumbar regions, behind the peritoneum, extending from the eleventh rib, nearly to the crest of the Ilium. The right kidney is lower than the left on account of its proximity to the liver.

How are the kidneys best palpated?

By bi-manual palpation—one hand under the back of the patient in the supine position, the other palpating in front with the knees drawn up.

What is the best method for percussing the Kidneys?

Patient prone, pillow under abdomen; percuss forcibly on each side of lumbar spine.

How is temperature taken?

By the clinical thermometer placed in the (1) mouth (4 minutes), (2) Axilla (8 minutes), or (3) Rectum (4 minutes). Keep the thermometer aseptic.

Is the temperature the same in these three places?

No. Temperature in the rectum is about ½ degree higher than in the mouth, and this is about ½ degree higher than in the axilla.

BLOOD.

(For First Year men.)

What is blood?

The liquid tissue of the body.

Of what does it chiefly consist?

Plasma and Corpuscles (red and white).

How much blood is there in the human body?

About one-thirteenth of the body weight.

Which corpuscle is the larger?

The white.

What is the size and shape of the red corpuscle?

A biconcave circular disc about $\frac{1}{3000}$ of an inch in diameter.

What is its function?

To carry oxygen to the tissues and return carbonic oxide to the lungs.

To what is its red color due?

To the presence of Hæmaglobin, the most complex molecule known.

What is the normal Specific Gravity of the blood?

About 1060.

Upon what does the specific gravity of the blood chiefly depend?

Upon the amount of hæmaglobin present.

How can you determine the specific gravity of the blood?

Fill several test tubes with mixtures of different proportions of glycerine and water, the specific gravity of each mixture being known. A jet of blood thrown from a capillary glass tube attached to the nozzle of a hypodermic syringe will be suspended in equilibrium, in that mixture whose specific gravity corresponds with that of the blood.

What is the best instrument for counting blood corpuscles?

The Thoma-Zeiss Hæmocytometer.

Of what parts does this instrument consist?

(1) A graduated capillary pipette with an ampulla or dilatation in its upper third, containing a glass bead and (2) a graduated microscopic slide. The pipette is marked at three points, viz: 0.5; 1, and 101. The field of the slide is divided into sixteen larger squares, each containing sixteen smaller squares. The capacity of each smaller square is $\frac{1}{4000}$ of a cubic millimeter.

What is the best diluting fluid for counting red corpuscles?

Two and a half per cent. solution of Bichromate of Potassium.

What are the advantages of this liquid?

Three. (1) Fixes shape and color of the red corpuscle;

(2) Prevents coagulation; (3) Prevents the formation of rouleaux.

From where is the drop of blood obtained?

Preferably from the tactile surface of the thumb or lobe of the ear.

When do we select the lobe of the ear?

When the epidermis of the finger is thick and horny.

How is the skin previously cleansed?

By washing successively with soap, alcohol and ether.

How is the puncture made?

A quick thrust with a Hawksley sticker or a large needle.

What is the next procedure?

Place the point of the pipette in the drop of blood, and by aspiration suck the blood up to the point marked one. Wipe off the excess, and placing the pipette in the bichromate solution, fill to the point marked 101. Mix thoroughly by shaking the pipette for at least one minute; then blow out the last portion of the fluid sucked up, and place a small drop of the blood mixture upon the graduated slide.

How is the cover-glass placed in position?

Do not drop it on, but *slide* it on, to avoid the admission of any air-bubbles. If there is any air in the mount, it must be repeated, after carefully cleansing both slide and cover-glass.

How is the count made?

Count the number of corpuscles in each of sixty-four small squares. Multiply the sum of these by 100 for the dilution and then by 4,000 for the capacity and divide this last product by 64 for the average. The quotient will give the number of red corpuscles per cubic millimeter.

What is the rule for Corpuscles touching the lines?

All corpuscles touching the right border, and base line, belong to that square.

How do you count white corpuscles?

Proceed as before, except that a three-tenth per cent. solution of Acetic acid is used for diluting instead of the bichromate of potassium.

Why do we use Acetic acid?

It dissolves out the red corpuscles and leaves the white alone in the field.

What is the normal count?

In the adult male 5,000,000 reds, and in the female 4,500,000 per cubic mm. The whites average about 10,000 per cubic mm.

What is the ratio of the red to the white corpuscles?

About 500 to 1, although the ratio is of less importance than the actual count of each.

What is a Micro-Millimeter?

The one-thousandth of a millimeter.

How is Hæmaglobin estimated?

By the Fleishl Hæmometer.

Of what parts does this instrument consist?

Four parts. (1) A metallic stand with a thumb-screw and a porcelain reflector. (2) A cylinder with a glass bottom, and divided into two chambers by a perpendicular diaphragm. (3) A framework graduated from zero to 120 degrees and holding a wedge-shaped piece of red glass thicker at the darker end. (4) A small capillary pipette on a platinum handle.

What is the procedure for estimating Hæmaglobin?

Fill both chambers of the cylinder equally with distilled water. Touch the small capillary pipette to the drop of blood on the patient's thumb, and by capillary attraction it fills itself. Agitate in one chamber of the distilled water until all the blood has been shaken out of the pipette. Complete the filling of both chambers with distilled water from a medicine dropper. Put the cylinder in place on the metallic stand and in a dark room, with candle-light, turn the thumb-screw until the intensity of color reflected from the red glass through the distilled water is identical with that of the blood mixture. Read off the number indicated and this will be the percentage of hæmaglobin present.

What is the Hæmatokrit?

An instrument (suggested by Blix and made by Hedin) which by centrifugal force collects the corpuscles in the distal end of a graduated capillary tube.

Describe this instrument?

It consists of a series of cog-wheels which transmit by means of a screw-thread, a rotary motion to a horizontal framework holding a graduated pipette divided into 50 parts, in which is placed equal volumes of blood and bichromate of potassium solution (2½ per cent.). One hundred revolutions of the hand-wheel produce ten thousand revolutions of the horizontal frame, and by centrifugal force the corpuscles are precipitated to the distal end of the pipette according to their relative specific gravity; the reds being heavier occupy the extreme outer end. After rotating for two minutes or 100 revolutions of the hand-wheel, read off, with the aid of a magnifying glass, the number of volumes of red corpuscles. Multiply this number by two for the dilution, and again by two for the percentage volume (because only fifty volumes were employed).

What is Dr. Daland's modification of the Hæmatokrit?

(1) The mechanism is covered in.

(2) The unsatisfactory screw-thread is replaced by a cog-wheel.

(3) The capillary tube is reduced in calibre from 1 mm. to ½ mm. and doubled in length, thus making it more easily read, and is divided into 200 parts.

What is the advantage of dividing the tube into 200 parts?

The number of volumes read off gives the percentage at once, without multiplication.

How may the number of red corpuscles be estimated from the number of volumes observed?

By adding five ciphers.

For what purposes are these blood-counting instruments useful?

For Diagnosis, Prognosis, Treatment and Experimentation.

What is meant by Rouleaux?

It is when the red corpuscles run together, looking like a roll of coins.

What is Crenation?

When blood is exposed to the air, the envelope of the red corpuscle shrinks up, causing the corpuscle to resemble somewhat a chestnut burr. This is crenation.

In mounting blood, how is the cover-glass prepared?

Wash it with alcohol and pass over a flame to dry and warm it.

In counting blood what microscopic power should be used?

About 500 diameters.

In differentiating blood disease, what power is desirable?

From 800 to 900 diameters.

In healthy blood how many white corpuscles are usually in any one field?

One or perhaps none. If there should be three or more, suspect Leucocytosis.

What is Leucocytosis?

An increase in the number of white corpuscles, but not so great as in Leukæmia.

What is Plethora?

An increase in the total amount of blood either in quantity or quality.

What microscopic change occurs in the blood in Plethora?

None, except an increase in the number of red corpuscles, in some cases amounting to 7,000,000 per cubic mm.

What is Anæmia?

The opposite of Plethora. A decrease in the total quantity or quality of the blood.

What blood diseases directly cause Anæmia?

(1) Hæmophilia; (2) Progressive Pernicious Anæmia; (3) Leukæmia; (4) Pseudo-Leukæmia; (5) Chlorosis; (6) Malaria.

What do you mean by Hemorrhagic Leucocytosis?

A temporary increase in white corpuscles after a hemorrhage.

What is meant by Terminal Leucocytosis?

A leucocytosis occurring at the end of certain wasting diseases (as Cancer and Phthisis).

What is simple Anæmia?

A moderate diminution in both hæmaglobin and red count; Whites not affected.

What is the characteristic change in the blood in Progressive Pernicious Anæmia?

The Red corpuscles are distorted in size and shape; and the reduction in hæmaglobin is not quite so great as the reduction in the red count, so that each red corpuscle has more coloring matter than normal.

What is this distortion of red corpuscles called?

Poikilocytosis.

What are the larger red corpuscles which are present in Pernicious Anæmia, called?

Megalocytes or Macrocytes.

What name is given to those which are smaller than normal?

Microcytes.

What is the characteristic blood change in Leukæmia?

The *White* corpuscles are greatly increased in number. Their size may also be increased by one-third.

What is the characteristic blood change in Pseudo-Leukæmia?

None, except a moderate degree of anæmia.

What is the blood change in Chlorosis?

A decided decrease in the Hæmaglobin below the red count (Hæmaglobin may fall as low as 25 per cent.) so that each red corpuscle has less coloring matter than normal.

What is the cause of Malaria?

A vegetable parasite called the Plasmodium Malariæ, which is found in the blood, in this disease.

What are the characteristic symptoms of Malaria?

Chill, Intermittent fever and Sweat; spleen enlarged and usually tender.

What is the nature of the Plasmodium?

An amœboid body about the size of a red corpuscle, partly filled with granular matter which is movable.

MISCELLANEOUS.

What is Œdema?

The extravasation of the serum of the blood into the connective tissue spaces, causing swelling of the part and pitting on pressure.

What is Hectic Fever?

An intermittent fever of septic origin.

What is Thoracentesis?

Tapping the pleural cavity.

Where is this best done?

In the seventh interspace just below the angle of the scapula.

What would you do if the heart became irregular or the patient coughed continually during a thoracentesis?

Withdraw the needle.

What kind of fremitus is produced by the whispered voice?

None.

What percussion notes are associated with a sense of resistance to the finger?

Dulness and flatness.

What is the difference between Puerile breathing and Broncho-Vesicular breathing ?

In Broncho-Vesicular breathing the expiration is harsh and prolonged and associated with impaired resonance on percussion. Puerile breathing is associated with hyper-resonance on percussion.

What are the modifications of Bronchial breathing ?

Cavernous and Amphoric breathing.

What are the causes of Cavernous breathing ?

(1) Any Excavation of the lung (from Phthisis, Abscess or Gangrene, Pneumothorax); (2) dilated bronchus.

What are the causes of Amphoric breathing?

(1) A large Phthisical cavity with tense walls; and, (2) Pneumothorax.

How may Amphoric breathing be imitated ?

By blowing on the mouth of an empty bottle.

Where can Bronchophony be heard normally ?

Over the Thyroid cartilage (Laryngophony).

What two Lung diseases give prolonged expiration ?

Phthisis and Emphysema.

How does the prolonged expiration differ in these two diseases ?

In Phthisis it is harsh and associated with impaired resonance on percussion.

In Emphysema it is soft and associated with hyper-resonance on percussion.

What is the cause of the dyspnœa in chlorosis?

As the hæmaglobin carries oxygen, diminished hæmaglobin means diminished oxygen, hence the patient must breathe faster to properly aerate the blood.

What is Jaundice?

A brownish discoloration of the tissues and secretions with bile pigment.

What causes produce Jaundice?

(1) Obstruction to the bile ducts (usual cause). Bile accumulates and is absorbed by the blood.

(2) Disintegration of the blood (as in yellow fever and grave blood diseases).

How is Jaundice distinguished from other discolorations of the skin?

In other pigmentations of the skin (such as Addison's disease, and chlorosis) the conjunctivæ and urine are not stained.

What is the rough test for recognizing bilious urine?

A greenish tint is usually noted at the surface, and if the urine be agitated a thick greenish-yellow foam quickly form.

What are the characteristic rales of Acute Bronchitis?

Dry rales—Sibilant and Sonorous.

Where is normal Vesicular breathing best heard?

Over the third rib in front or in the infra-axillary region laterally.

What is meant by Vomica?

It is another name for a phthisical cavity.

What is the most common seat for Croupous Pneumonia?

The lower lobe of the right lung.

What are the Pathognomonic signs of the first stage of Croupous Pneumonia?

Rusty sputum and Crepitant rales.

What are the pathognomonic signs of the second stage?

Bronchophony and Bronchial breathing.

What is the pathognomonic sign of the first stage of Pleurisy?

The to-and-fro friction sound synchronous with respiration.

What is the diagnostic sign of the stage of effusion?

Movable dulness on percussion.

What is the difference between the signs of Croupous and Catarrhal Pneumonia?

In catarrhal pneumonia signs are bilateral, less pronounced and sub-crepitant rales in place of crepitant.

What are the diagnostic signs of Phthisis in the first stage?

Prolonged harsh expiration and Crackling rales.

What are the valuable signs of the second stage?

Bronchial breathing and increased vocal fremitus and resonance with dulness on percussion.

What are the characteristic signs of the third stage?

Pectoriloquy, local tympany and cavernous breathing, usually with bubbling rales.

What is Anthracosis?

A pigmentation of the lung structure caused by coal dust.

What are the valuable signs of Pulmonary Emphysema?

Bilateral hyper-resonance on percussion, with decreased vocal fremitus and vocal resonance.

What are the diagnostic signs of Pneumothorax?

Universal unilateral tympany, Amphoric breathing, and Amphoric Pectoriloquy.

What are the Pathognomonic signs of Hydro-Pneumothorax?

Hippocratic succussion splash and *freely* movable dulness.

What is the immediate cause of Fatty degeneration of the heart?

Some interference with the blood supply to the coronary artery.

What is the most frequent form of valvular heart disease?

Mitral Regurgitation. (70 per cent. of all valvulitis).

Which forms of valvular disease give a thrill?

Mitral obstruction (typically) and sometimes Mitral regurgitation, and Aortic obstruction.

What is the Corrigan or Water-hammer Pulse?

A quick, full receding pulse characteristic of Aortic regurgitation.

What is the characteristic sign of the first stage of Acute Pericarditis?

The to-and-fro friction sound synchronous with the heart-beat, and not ceasing with respiration.

* **What is a valuable concomitant sign of Mitral Regurgitation?**

Accentuation of the Pulmonic second sound.

From what must Pericardial effusion be distinguished?

Cardiac Dilatation.

* **What form of Valvular trouble does excessive straining sometimes produce?**

Aortic regurgitation.

* **What changes are produced in the size of the heart by mitral obstruction?**

Enlargement of left Auricle and right Ventricle.

* **How does Mitral regurgitation affect the size of the heart?**

Leads to enlargement of Left Auricle and Right and Left Ventricle.

* **What form of Valvulitis gives eccentric hypertrophy of the Left Ventricle?**

Aortic regurgitation.

Which forms of Valvulitis give a typically small pulse?

Aortic stenosis and Mitral stenosis.

* **In what Lung diseases do we get Sub-crepitant rales?**

Capillary bronchitis; Incipient Phthisis; Œdema of

the Lungs ; Catarrhal Pneumonia ; Third stage of Croupous Pneumonia.

What is Dyspnœa ?

Difficult breathing, or shortness of breath.

What are the two kinds of Dyspnœa ?

(1) Subjective (felt by the patient).
(2) Objective (noted by the physician).

What is Orthopnœa ?

Exaggerated dyspnœa, or shortness of breath, so intense that the patient has to sit up to breathe.

What is Dysphagia ?

Difficulty in swallowing.

What may cause recession of the lower ribs ?

(1) Asthma ; (2) Rickets ; (3) Laryngeal obstruction.

What are the most frequent causes of protrusion of the lower ribs ?

(1) Abdominal dropsy and (2) any enlargement of the liver or spleen.

What is Subcutaneous Emphysema ?

An effusion of air under the skin.

What is Aphonia ?

Loss of voice.

What is Apnœa ?

Cessation of breathing.

What is Colic?

A painful spasm of a mucous canal.

What is another name for Vocal Fremitus?

Tactile fremitus.

What is the difference between a rapid heart and palpitation of the heart?

Palpitation means a rapidly beating heart, which attracts the patient's own attention. (An accelerated heart-beat not recognized by the patient, is not Palpitation.)

What is the duration of the First stage of Croupous Pneumonia?

Usually about twenty-four hours.

What is the Decubitus of the First stage?

Patient generally lies upon the affected side.

In what conditions is Metallic Tinkling heard?

In Hydro-pneumothorax (typically) and sometimes in a phthisical cavity.

What is meant by Arcus Senilis?

A grey area of fatty degeneration in the periphery of the Iris of the eye, seen in the aged. If it extends completely around the iris it is called the *senile ring*.

What is Cyanosis?

A blueness of the surface from imperfect oxidation of the blood. Usually manifested first in the lips and finger-tips.

TABLE OF DIFFERENTIAL DIAGNOSIS BETWEEN ORGANIC AND FUNCTIONAL HEART-MURMURS.

ANÆMIC MURMUR.	ORGANIC MURMUR.
1. *Must* be associated with anæmia.	1. Only accidentally so.
2. No alteration in size of heart.	2. Usually enlarged.
3. Best heard over base of heart.	3. Not always.
4. Not transmitted.	4. Generally transmitted.
5. Varies at different times.	5. Quite constant.
6. Soft and musical.	6. Rough and harsh.
7. May disappear after exercise.	7. Intensified by exercise.
8. Not preceded by rheumatism.	8. Preceded by definite history.
9. Associated with a venous hum.	9. No venous hum.
10. Disappears under treatment.	10. Not materially affected by treatment.
11. Usually systolic in time.	11. Varies according to valve affected.

CLASSIFICATION OF RALES OR RHONCI.

I. According to Dr. Musser:

- Râles
  - 1. Pleuritic = Friction-sounds.
  - 2. Pulmonary
    - *a.* Vesicular = Crepitant.
    - *b.* Bronchial
      - Dry
        - Sibilant.
        - Sonorous.
      - Moist
        - Subcrepitant.
        - Bubbling.
        - Gurgling.

II. According to Dr. Daland:

- Râles
  - 1. Dry
    - *a.* Sibilant.
    - *b.* Sonorous.
  - 2. Moist
    - *a.* Crepitant.
    - *b.* Subcrepitant.
    - *c.* Crackling.
    - *d.* Mucous
      - Large.
      - Medium.
      - Small.
    - *e.* Bubbling.

TABLE OF ENDOCARDIAL MURMURS.

ORDER OF FREQUENCY.	MAXIMUM INTENSITY.	TIME.	TRANSMISSION.	LESION.
1. Mitral Regurgitation.	Apex.	Systolic.	Left axilla and angle of left scapula.	Insufficiency.
2. Aortic Obstruction.	Aortic cartilage.	Systolic.	Into carotid artery.	Stenosis or roughening.
3. Aortic Regurgitation.	Aortic cartilage.	Diastolic.	Down the sternum. Down sternum to ensiform.	Insufficiency.
4. Mitral Obstruction.	One inch above apex.	Presystolic.	Not transmitted.	Stenosis.
5. Tricuspid Regurgitation.	Ensiform cartilage.	Systolic.	Toward epigastrium.	Insufficiency.
6. Tricuspid Obstruction.	Ensiform cartilage.	Presystolic.	Not transmitted.	Stenosis.
7. Pulmonary Obstruction.	Pulmonary cartilage.	Systolic.	Into pulmonary artery.	Stenosis.
8. Pulmonary Regurgitation.	Pulmonary cartilage.	Diastolic.	Down the sternum.	Insufficiency.

* METHODS OF STAINING TUBERCLE BACILLI.

Our ability to recognize the tubercle bacillus depends upon its power, after having been stained, to resist the decolorizing effect of acids.

In its microscopic recognition, it is more satisfactory to use a $\frac{1}{12}$ oil immersion lens.

I. Weigert-Ehrlich Method:

Spread a thin film of the thickest part of the sputum on a cover-glass and dry by holding it several inches above an alcohol flame. When cool, place in the staining fluid prepared as follows: Mix 5 c.c. of aniline oil with 100 c.c. of distilled water; filter and add 11 c.c. of a saturated solution of fuchsin in alcohol. Leave cover-glass in stain for half an hour (in doubtful cases for twenty-four hours), wash in distilled water: then decolorize in thirty per cent. aqueous solution of nitric acid for a few seconds. Wash off acid with distilled water and counter-stain for one minute in an aqueous solution of methylene blue, or in a two per cent. aqueous solution of Bismarck Brown; rinse, then dry and mount in Canada Balsam.

II. Ziehl's Method:

1. Spread thin film of morning sputum on cover-glass.
2. Dry in the air.
3. Stain for three to five minutes with Carbol-Fuchsin.

   Carbol-Fuchsin { Fuchsin 2. / Alcohol 10. / Carbolic Acid (five per cent. aqueous solution) 100. }

   Drop the stain upon the cover until it is full. Hold over a lamp until white fumes begin to rise. Continue to keep hot three to five minutes.
4. Wash in water.
5. Decolorize and counter-stain (blue) for exactly thirty seconds with Gabbett's solution:

   { Methyl blue 2. / Sulphuric acid 25. / Water 75. }
6. Wash in water until only a faint blue color remains.
7. Dry *thoroughly* in the air.
8. Mount with a drop of Canada Balsam.

* URINE.

What are the characteristics of Normal Urine?

Light amber-colored liquid, acid reaction and specific gravity from 1015 to 1025.

To what does the urine owe its color?

To the presence of urobilin, a constituent of bile.

How does the intensity of color vary?

It increases with the specific gravity (except in diabetic urine, which has a high specific gravity and is very pale.)

Upon what does the Acid reaction depend?

Upon the presence of acid sodium phosphate (and not free acid).

What is the origin of the Acid sodium phosphate?

It results from the sodium phosphate of the blood coming in contact with the uric acid of the urine.

Upon what does the specific Gravity of Urine depend?

Upon the amount of solids in solution.

What are the chief solids concerned?

Urea (organic) and Sodium Chloride (inorganic).

What is the average quantity of urine voided?

About fifty ounces in twenty four hours.

How can the percentage of solid matter be approximate y estimated from the specific Gravity?

Multiply the last two figures of the specific gravity by 0.233.

(Thus if specific gravity = 1020; multiply 20 by 0.233 = 4.66 per cent. solids.)

Why does normal urine become alkaline after standing for some time?

The urea is decomposed into Ammonium Carbonate by the micrococci present.

How can you detect the presence of Sodium Chloride in the Urine?

Add a few drops of Nitric acid, and treat with nitrate of silver. If sodium chloride is present in normal quantity, a white curdy precipitate will form. If it is diminished in quantity only a milkiness will occur.

What may interfere with this test?

The presence of Albumen, which must be removed by coagulating and filtering.

How do you test the reaction of Urine?

With Litmus paper. Acid turns blue to red, alkaline turns red to blue. Neutral has no action on either color.

What is the ordinary way of testing for Albumen?

Heat the urine to the boiling-point and add one-tenth its volume of Nitric Acid. If any albumen be present it will be precipitated.

What is the appearance of Albuminous urine?

Pale in color and has a low specific gravity.

What is the test for sugar in the Urine?

Boil some Fehling's solution with four times its volume of water. Add two or three drops of urine at a time and heat after each addition, if sugar is present a yellowish-red precipitate will be formed.

What is the general appearance of Diabetic urea?

Paler than normal; sweet taste, no odor, and high specific gravity (1030 to 1060.)

What is a good test for Bile in the Urine?

Allow a specimen of urine and a few drops of red fuming nitric acid to gradually intermingle on a porcelain dish, and an iridescent "play of colors" will occur if bile be present.

How can you determine the percentage of Urea?

Mix one volume of urine with seven volumes of Labarraque's solution, which causes a reduction in specific gravity by decomposing the urea. After half an hour, multiply the loss in specific gravity by 0.77, which gives the percentage of Urea present.

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